



# CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

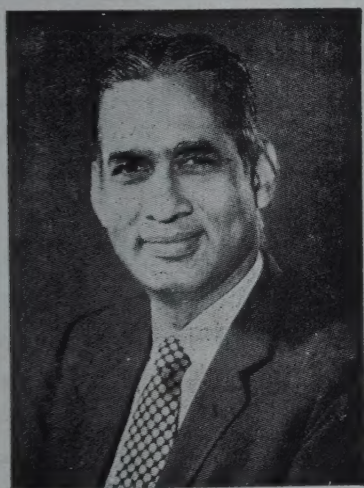
VOL. 27

15 AUGUST 1977

NO. 15

## Prof. Nayudamma, DGSIR, Lays Down Office

Prof. Y. Nayudamma, Director General, Scientific & Industrial Research, and Secretary to the Government of India in the Department of Science and Technology, relinquished charge of



his offices on 27 July 1977. Prof. Nayudamma, who was CSIR chief for nearly six years, had a challenging assignment as soon as he took over as DGSIR on 27 August 1971. His immediate task was to implement the major recommendations of the Sarkar Committee of Enquiry regarding structural changes in CSIR. In accordance with the recommendations, Prof. Nayudamma took steps to delegate more autonomy to the national laboratories and to make the central office function more as a technical headquarters than merely as an administrative one. Under Prof. Nayudamma, known for his unconventional approach and innovative, venture-oriented management, CSIR acquired a feeling of trust, an environment for collective leadership and creative innovative activity, and the realization that public funding is

publicly accountable, that research must be made relevant to the needs of the people and to the national priorities. It was he who was responsible for a multidisciplinary, multiorganizational task force approach to solving technological tasks. He recognized the importance of project planning, programming, budgeting, monitoring and evaluation. Under his stewardship the national laboratories set about redefining their goals and objectives, and brought a sharper focus on their charter. He introduced decentralized, democratized, internalized collegiate management not only at the Governing Body level but also at the executive committees of the laboratories. Firm and formal linkages were established with states through polytechnology clinics, state R & D committees, R & D and industry get-togethers and extension centres. CSIR laboratories came to meaningful and fruitful understanding with industry, engineering consultancy firms, other research agencies and universities. To his credit stands the introduction, for the first time, of venture-oriented management practices like permitting CSIR scientists to set up their own industry with CSIR technologies.

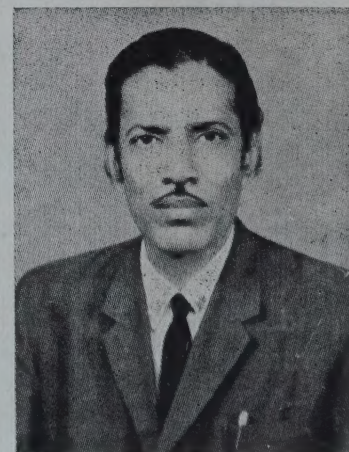
'Science for the common man' has always been Prof. Nayudamma's life's mission. Towards this end, he introduced the Adoption of Backward Districts Programme with a view to changing the face of under-development through the application of science and technology. Starting with the adoption of Karimnagar district in Andhra Pradesh, this idea has acquired

a large multiplier effect throughout the country.

Augmenting scientific and technological cooperation between CSIR and foreign countries has been one of Prof. Nayudamma's praiseworthy achievements. He set new goals and  
*(Continued on page 114)*

## Dr A. Ramachandran Takes Over as DGSIR

Dr Arcot Ramachandran, Secretary to the Government of India, Department of Science and Technology, has assumed the additional charge of Director General, Scientific & Industrial Research, with effect from 28 July 1977.



Dr Ramachandran (born 6 April 1923, Madras) graduated in engineering with honours from the University of Madras in 1943, obtained his master's degree in mechanical engineering (1947) and Ph. D. (1949) from the Purdue University (USA).

Dr Ramachandran joined the Indian Institute of Science (IISc), Bangalore, in 1950 and served as Assistant Professor of Mechanical Engineering



(1950-57) and Professor and Head, Department of Mechanical Engineering (1957-67). He also headed at IISc the then newly formed Department of Industrial Management during 1965-67. Dr Ramachandran was appointed Director of the Indian Institute of Technology, Madras, in 1967. He was appointed Secretary to the Government of India, Department of Science and Technology, on 15 March 1973.

Recipient of the Distinguished Alumnus award (1972) of the Purdue University, Dr Ramachandran is a Fellow of the Indian National Science Academy and National Academy of Sciences.

Dr Ramachandran is associated with various professional institutions. He is a fellow of the Institution of Mechanical Engineers (London), Institution of Engineers (India), Institution of Production Engineers (UK), and American Society of Mechanical Engineers. He is the president of Solar Energy Society of India (1977-80); and member, American Society of Engineering Education.

Dr Ramachandran has been associated, in different capacities, with the various national and international organizations/committees/conferences: chairman, UN Preparatory Committee for United Nations Conference on Science and Technology for Development to be held in 1979; chairman, executive committee, Association for Engineering Education in South and Central Asia (1973-74); chairman, UNESCO Experts Group on Engineering Education (1974); chairman, ESCAP Experts Group on Regional Centre for Transfer of Technology, Bangkok (1975); member, Scientific Council and the Executive Committee, International Centre for Heat and Mass Transfer, Yugoslavia; delegate, UNEP Governing Council Meeting, Nairobi (1976); expert, UNESCO Man and Biosphere Meeting, Ottawa, Canada (1975); chairman, UNISIST National Committee; chairman, Science and Engineering Research Coun-

cil; chairman, Indian National Committee for International Institute of Refrigeration; vice chairman, National Remote Sensing Agency, Hyderabad; president, Indian Society of Heat & Mass Transfer; member, National Committee on Science and Technology; and member, Society, CSIR.

Dr Ramachandran is on the editorial boards of International Journal of Heat and Mass Transfer, Indian Journal of Technology, Indian and Eastern Engineer, and Energy Management. He has to his credit 125 papers in the fields of engineering sciences, research management, science and technology, and information systems.

### **Prof. Nayudamma**

*(Continued from page 113)*

directions, introducing the concept of complementarity, as opposed to the traditional acceptor/donor concept, in bilateral and multilateral cooperation in science and technology. Prof. Nayudamma is the founder-member of the Association for Science Cooperation in Asia to foster greater scientific collaboration between India and the other Asian countries. The International Seminar on Transfer of Technology was also organized by him in 1972 and as a result, Indo-UNIDO agreement was signed—CSIR acting as the agent for technology transfer from one developing country to the other. He is also the Indian representative in the Commonwealth Science Council.

The setting up of a Centre for the Study of Science, Technology and Development at CSIR to study the problems of development and the role of science for development, particularly in developing countries, shows his clear vision and commitment to the cause of developing countries.

Prof. Nayudamma has made significant contributions towards making CSIR technology sought for in the developing countries of Asia and Africa. As a result, there is now a perceptible demand for CSIR techno-

logies in these countries. Moreover, CSIR has entered into scientific and technical collaboration with many countries of Europe.

Dr Yelavarthy Nayudamma (born 10 Sep. 1922, Andhra Pradesh) graduated in industrial chemistry from the Banaras Hindu University, Varanasi. Deputed by the Government of Madras for advanced training in leather technology in UK (1946-47) and USA (1947-51), he took his M. S. and Ph.D. degrees in leather chemistry from the Lehigh University (USA). After his return to India, he joined, in December 1951, the Central Leather Research Institute (CLRI), Madras, which he helped construct, plan and organize into a full-fledged national laboratory. He took over as its Director in February 1958. Under his leadership CLRI emerged as one of the most renowned centres of leather research and the largest of its kind in the world.

Since 1943, Prof. Nayudamma has been in close touch with tanner's problems and has accelerated the progress of the craft-based leather industry by introducing proven technology in it. He has been instrumental in the creation of the Indian Hides and Skins Improvement Society, the Indian Leather Fair Society, the Leather Club, and the Coromandal Chemicals (an exclusive concern of tanners for exploiting CLRI research results) for promoting the interests of the tanners in the country.

As a consultant to the UN, Prof. Nayudamma has contributed to the growth and development of leather industries in several developing countries like Sudan, Somalia, Nigeria, Turkey, Iran, Tanzania, Ethiopia, Kenya, Rwanda and Cameroun.

Among the many honours and awards received by Prof. Nayudamma are the Dr K. G. Naik gold medal for researches in chemistry (1965); Fellowships of the Indian National Science Academy, the National Academy of Sciences, and the Indian Academy of Sciences; Presidentship of the Institu-



tion of Chemists (India), the International Union of Leather Chemists Society, and the American Leather Chemists Association. He is a member of the Pugwash movement.

### Distinguished Scientist

Prof. Nayudamma is laying down office as DGSIR — only to take up a more challenging task. The first director general of CSIR to lay down office of his own accord, Dr Nayudamma is returning to active research at CLRI as a 'Distinguished Scientist'. It may be mentioned here that Dr Nayudamma was a staunch advocate that, should they find it difficult to pursue research because of administrative burdens, the directors of national laboratories were free to step down to go back to active research while enjoying the director's salaries. Prof. Nayudamma will now be teaching and guiding post-graduates as honorary professor at the Madras University. He will also continue his international consultancy work and will be engaged in the study of technology generation, transfer and utilization; appropriate technologies and integrated development; and technology, social change and social welfare. He will also continue as honorary adviser to the Andhra Pradesh Government. It will also be his endeavour to demonstrate how with the use of indigenously developed leather technologies, low capital intensive but high labour intensive projects could be implemented in the countryside.

### Workshop on Packaging at CFTRI

A workshop on design, evaluation and quality control of corrugated fibreboard boxes was organized by the Centre for Food Packaging of the Central Food Technological Research Institute (CFTRI), Mysore, on 15 & 16 July 1977. The workshop, inaugurated by Dr B. L. Amla, Director of CFTRI, was designed to create an understanding of the procedure of designing corrugated fibreboard boxes, the nature and causes of defects that occur

in them, and the quality control checks to detect them. Fifteen participants including the representatives of fibreboard manufacturers, the users, Small Industries Service Institute and one scholar from the United Nations University attended the workshop.

The workshop covered structural concepts and properties of corrugated fibreboard; method of manufacture and possible defects, their causes, and their effects on the strength of the fibreboard boxes; design of corrugated fibreboard boxes; tests on corrugated fibreboard and their relevance to the performance of the box; performance evaluation and interpretation of results; and specification, standards and quality control for manufacturer and user.

Besides lectures and demonstrations by CFTRI experts, the workshop discussed various problems faced by the packaging industry and the users. Several useful suggestions were made by the participants for implementation.

The CFTRI experts who conducted the workshop included Sarvashri P.V. Raju, K. R. Kumar, B. Mahadevaiah, A. R. V. Rao and J. K. Crown.

### Electrolytic Process for Glyoxalic Acid

The Central Electrochemical Research Institute (CECRI), Karaikudi, has worked out an electrolytic process for the production of glyoxalic acid from oxalic acid. In this process the product can be isolated easily in pure form. Evaluation trials by an established firm showed that the samples find consumers' acceptability.

Glyoxalic acid is used in the synthesis of many heterocyclic compounds of commercial importance. It is also used in the synthesis of vanillin and vitamin C derivatives. There is no reported production of glyoxalic acid in India and the estimated demand is of the order of 50-100 tonnes/annum.

All the raw materials required for manufacturing the product are available indigenously and the equipment

(except for cation exchange membrane) can be obtained indigenously. The total investment for a plant with a production capacity of 100 kg/day is estimated at Rs 13 lakh and the cost of production at Rs 75/kg. The return on investment is expected to be 58%.

### De-sulphating of Water for Mixing and Curing Concrete

Water used for mixing and curing concrete should not contain sulphates beyond a certain limit, which according to IS : 456-1964 (code of practice for plain and reinforced concrete) is 500 ppm. On reference from various construction agencies in India, the Central Road Research Institute, New Delhi, has carried out techno-economic studies on the various methods used for the removal of sulphates.

Sulphatic water with sulphates content of up to 2000 ppm could be treated with 4 g of calcium hydroxide per litre. The supernatant water up to a height of about one-third from the bottom would meet the IS specifications. However, for water containing sulphates concentrations of 2000-4000 ppm the treatment will have to be repeated.

Water having sulphates of up to 4000 ppm concentration could be treated with barium chloride at the rate of 12.2 g/litre of water for the removal of sulphates.

Treatment with 4 g of calcium hydroxide, 1 g of agar agar and 1 g of alum was also found to be sufficient for one litre of water containing sulphates of up to 4000 ppm. Agar agar and alum helped in the very early coagulation and settlement of  $\text{CaSO}_4$ . For waters containing higher than 4000 ppm of sulphates, a second treatment was necessary.

These three methods take 12-15 hr, 2-3 hr and 15 min. respectively. The costs of a single treatment come to Re 0.36, Rs 22.50 and Rs 108.75 for 100 ft<sup>3</sup> (2.83 m<sup>3</sup>) of 1 : 2 : 4 concrete respectively, which constitute 0.08, 5.0 and 24.2% of the concrete-making cost respectively.



# NUMERICAL ALGORITHMS FOR SOLVING NONLINEAR MATHEMATICAL PROBLEMS

Bhatnagar Prize-winner Prof. Jain's Work

The new 'algorithms' developed by Prof. Jain have led to the solution of complex physical problems in such diverse fields as design of vertical take-off aircraft or hovercraft and ships, heat



Prof. P. C. Jain

transfer problems, magnetohydrodynamic power generation, etc. The technique of formulating mathematical models for solving problems in engineering design, though dispensed with the heavy expenditure involved in experimental studies, is beset with the problem of solving complicated nonlinear equation defying solutions by the usual mathematical procedures. The numerical algorithms developed by Jain have been useful in obtaining satisfactory solutions to many technological problems.

Jain has developed algorithms of far-reaching importance for solving nonlinear problems over domains with regular or irregular boundaries. Algorithms based on finite difference technique, quasilinearization and invariant imbedding, have been developed and applied to various problems in fluid mechanics, heat transfer, etc. These techniques have not only added to the present knowledge of fluid dynamics and its applications but hold promise of enabling applied mathematicians, scientists and technologists in solving still more difficult, highly nonlinear problems in the near future. His contributions are likely to have a signifi-

cant impact on the solution of problems in the general areas of stability and turbulence in fluid dynamics, environmental control, monsoon dynamics, numerical weather forecasting, pharmacokinetics, biomechanics and magnetohydrodynamic power generation.

The problem of jet impingement is of fundamental importance and has wide applications in the development of vertical-take-off aircraft, hovercraft, and control for soft-landing of satellites. When a jet impinges on a fixed surface, the free-jet and the wall-jet regions are of considerable interest.

By using the mathematical model based on the Navier-Stokes equations for the impingement of a jet, numerical solutions for the unsteady stagnation point flow over a flat plate are obtained by introducing boundary layer approximations and with the help of finite difference method. The numerical algorithm has been analyzed for its stability and convergence.

The problem of vortex shedding is of great practical importance in the design of ships and other moving bluff bodies; the elimination of the vortex street is likely to result in the reduction of the drag on the moving body. The suppression of the shedding of vortices and of the formation of the vortex street could be achieved either by preventing the appearance of the instabilities or by decreasing the rate of generation of the vorticity. Jain analyzed the problem using a mathematical model based on a time-dependent viscous flow of an incompressible fluid past a circular cylinder in polar coordinates. By introducing a suitable transformation, the physical domain of the fluid flow is transformed into a rectangular domain for computational purposes. The finite difference method has been judiciously applied to develop an 'algorithm' for solving the problem at low and intermediate Reynolds numbers of up to 500. Streamlines, equivorticity lines as well as the distribution of pressure, vorticity, etc. have been computed on the surface

of the cylinder. The results show the formation of Karman-vortex-street in the wake of the cylinder. Jain's technique is more efficient and less time-consuming than the techniques available in the literature.

In a number of engineering applications, such as in the theory of hot-wire anemometer, in the design of heat exchangers, etc., the problem of heat transfer between a circular cylinder and its surrounding stream of a viscous fluid is of great interest. The dynamical behaviour of the flow close to the surface of a body strongly affects the rate of heat transfer from a warm rigid surface to the cold fluid flow around it. But this dynamical behaviour of the flow, in the region of the separation which occurs at the rear of the body when the flow rate is sufficiently high, is not yet well understood. An 'algorithm' has been developed by Jain for tackling this problem. The algorithm is based upon the finite difference method. It is found that a significant change in the pattern of the isotherms takes place in the region of the wake only; the pattern of the isotherms gets distorted as the shedding of the vortices takes place in the flow.

The algorithms based on finite difference method have been successfully used for solving nonlinear mathematical models of several problems. But there are several models in which the domain of the nonlinear mathematical problem may have irregular boundary. New combination techniques based on certain linearization procedures and invariant imbedding have been developed for solving some nonlinear elliptic and parabolic problems over domains with irregular boundaries. The proposed techniques can be extended for developing algorithms for solving other complicated nonlinear problems. Two typical cases are the algorithms developed in connection with the minimal surface problem and the Burger's equation and nonlinear diffusion equation.

Prof. P. C. Jain of the Indian Institute of Technology, Bombay, has been awarded the Shanti Swarup Bhatnagar prize in mathematical sciences for the year 1975 (jointly with Prof. M. S. Narasimhan) [CSIR News, 27 (1977), 57].



## Deputation Briefs

Shri K. Ramaswami of the National Science Library, Indian National Scientific Documentation Centre (INSDOC), New Delhi, visited Ankara, Turkey, on deputation, from 13 to 26 June 1977 to participate in the seminar on Administration for Managers of Scientific and Technical Libraries and Information Services, organized by the Scientific and Technical Research Council of Turkey Documentation Centre (TÜRDOK) and Unesco in the framework of its UNISIST Programme.

The main objective of this seminar was to form highly qualified managers of library and information systems in providing the participants with the elements of organizational and managerial theory and practice as applied to the efficient planning and administration of information and documentation services in science and technology, taking into account the impact of technological change and innovation.

Thirty-one library and information scientists from eighteen countries participated in the two-week seminar. The course was behaviourally oriented, concentrating heavily upon the management of human beings in ways which enhance and improve organizational efficiency and effectiveness. Important topics, such as the role of administrator in the organizations; organization structure: design and dynamics; managing for motivation and productivity; managerial leadership; financial analysis, planning and control; and managerial decision-making were discussed at the seminar. Each topic was considered in the context of contemporary developments in the library and information world. Shri Ramaswami was the leader on 'group problem solving and discussion leadership' in the behaviour of information personnel, and participated in the discussions on managerial decision-making. He was also the group leader representing the special libraries, information and referral centres and presented the report

of his group in the workshop and open forum on the last day of the seminar. The report highlighted the role of Insdoc in the information dissemination activities and the status of national information infrastructure development in India.

He also visited Hacettepe University Library, Middle East Technical University Library and TÜRDOK, Ankara.

The other Indian participant in the seminar was Shri P.K. Sikka, of the Department of Science and Technology, Government of India, New Delhi.

## Consumer Preference for Textiles

The Silk & Art Silk Mills' Research Association (SASMIRA), Bombay, has brought out this publication based on its study carried out recently on the consumer preference for textiles. The publication covers the trends in consumer preference for textiles in relation to the production profile of textiles in India. The study deals, apart from consumers, with manufacturers, wholesalers and retailers of textiles. The study has been confined to Bombay city because of its cosmopolitan nature. The 70-page publication is priced at Rs 10.00 and can be had from the Director, The Silk & Art Silk Mills' Research Association, Worli, Bombay 400025.

## Science Policy Studies in India: A Status Report

This publication, brought out by Prof. A. Rahman of the Centre for the Study of Science, Technology and Development, CSIR, attempts to analyze the publications on science policy by Indian authors with a view to: tracing the historical development and present trends of science policy studies in India; and examining the extent to which professionalization has taken place in this field and the possibilities of introducing it as an academic discipline.

For the purpose of the analysis, all publications on science policy which

appeared during 1967-74 were collected and classified according to the SPINES classification system of Unesco. In view of the fact that there are no journals in India which are exclusively devoted to science policy studies—a factor which is detrimental to attaining professional excellence in the field—the author pleads for starting at least one journal, to begin with, in this area.

Enquiries regarding the publication (royal 8vo, 136 pages) may be addressed to Prof. A. Rahman, Centre for the Study of Science, Technology and Development, CSIR, Rafi Marg, New Delhi 110001.

## PROGRESS REPORTS

### IIEM Annual Report: 1975

The research programme of the Indian Institute of Experimental Medicine (IIEM), Calcutta, for 1975 comprised 16 projects of which four new research projects proposed under the Fifth Five Year Plan were assigned high priority, according to its annual report for 1975 brought out recently. Work was continued on three projects started earlier under the purview of the coordination council for biological sciences; these were: (i) fungal acid protease, (ii) follow-up chemical investigation of Indian medicinal plants identified in the preliminary screening programme of the Central Drug Research Institute, Lucknow, and the Regional Research Laboratory, Jammu, and (iii) experimental cultivation of *Dioscorea* yams of high diosgenin content in connection with which various samples of *D. prazeri* and *D. deltoidea* were analyzed for diosgenin content. Work on toxæmias of pregnancy, initiated in 1973 in collaboration with the Department of Gynaecology and Obstetrics, Medical College, Calcutta, was also continued.

The process for the fractionation of plasma proteins at room temperature was assigned to the National Research Development Corporation of India for commercialization.



## PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

### Rust Converting Composition

*Kallstroemia pubescens* (G. Don) Dandy, which grows wild in eastern and southern India, has been found to be a good source of diosgenin. A method for isolation of diosgenin from this plant was worked out.

An extracellular endodextranase, from *Penicillium janthinellum*, was purified to electrophoretic homogeneity. Its potential uses are in the preparation of clinical dextran, in the sugar industry to improve the crystallization of sugar, and in the prevention of dental caries.

Mutants of the feeble methionine-producing strain of *Esch. coli* previously isolated from natural resources were obtained which possessed enhanced methionine-producing capacity. These mutants were found to produce significant quantities of isoleucine and valine also.

Serum monoamine oxidase (MAO) levels were found to be decreased by 60% in the eclamptic women as compared to those in normal women. The placental MAO was also decreased by 45% in eclampsia. Besides, plasma fibrinogen was found to be significantly increased in eclampsia in the third trimester while in pre-eclamptic women the values were near normal. These two findings may prove to be of value in establishing the aetiopathology of eclampsia.

DNA from rabbits was used for genetic transfer of  $\beta$ -galactosidase and other nutritional markers to *Esch. coli* K-12F-strain. Polymyxin resistance was transferred from *Bacillus polymyxa* to several Gram-positive and Gram-negative bacteria. Progress was achieved in transfer of antibiotic resistance in staphylococci, and some of the critical factors involved in such transfers were identified. Laboratory-produced R-factors capable of being transferred both by the conjugal and transformation processes were obtained eventually from chromosomal mutants.

Twenty-five research papers were published and 24 papers were presented at symposia, seminars and conferences held during the year.

It is a common practice to remove rust from steel structures before painting or repainting. Conventionally, rust is removed by mechanical or chemical methods which not only require shop facilities but also involve labour- and time-consuming process.

Keeping in view the drawbacks of conventional methods, the Central Electrochemical Research Institute, Karaikudi, has developed a rust converting composition which can be used to convert rust on steel surfaces into a protective coating. The surface so converted acts as a good base for painting and increases the paint life. The composition can be applied by brushing on erected steel structures.

The process for the manufacture of the composition consists in mixing phosphoric acid, manganese carbonate and acetic acid. A metal powder is added in suitable proportions to the above composition just before its application on rusted surface. The composition converts rust into a black, hard, protective coating in a period of 2 hr.

The ingredients are to be mixed in proper proportions to get an effective rust converting composition which will give black protective coating on rusted surfaces. The shelf life is 8 hr after mixing.

The process has been studied on 90 litres per batch scale. All the raw materials used in the composition are indigenously available. No special equipment is required. Only tanks made of polythene are needed.

The suggested capacity for an economically viable unit is 150 tonnes of rust converter per annum. It is estimated that a sum of Rs 3.03 lakh will be required to put up such a unit. The cost of production has been worked out to be Rs 7.50/kg

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

### Electroless Tin-Plating Bath for Printed Circuit

The printed circuit board technology in the electronics industry requires a special type of tin-plating composition. The main considerations are: (i) bath should be neither highly acidic nor alkaline; (ii) bath should be operated at room temperature; (iii) deposit should be free of pores; (iv) diffusion of copper through the tin deposits should be minimum; (v) tin-coating should not tarnish on storage (this would make it possible to store tin-plated printed circuit boards and use them as and when required, which is of great value if the electronic circuit producer does not have his own printed circuit board manufacturing facility); and (vi) the tin plate should be easily 'wetted' by solder so that soldering time is minimum, which not only increases production rate but also saves integrated circuits from getting spoiled because of heat.

The National Aeronautical Laboratory, Bangalore, has developed an electroless tin-plating bath for coating on printed circuit boards (copper-clad hylam and copper-clad glass epoxy boards). This bath fulfils all the above requirements. Electroless tinning of printed circuit boards of up to 12 in.  $\times$  8 in. has been done in a routine manner with this bath and these printed circuit boards have been used for the various projects of the laboratory, e.g. the electronics pilot plant and the transducer pilot plant. The performance has been found satisfactory. The bath can also be used for tin-coating of pins, screws, nuts, etc. for providing a surface with better solderability.



At present no satisfactory electroless tin-plating bath is available indigenously. It is expected that with indigenous availability the demand will increase considerably.

The main raw materials are thiourea, stannous chloride, sodium fluoride, antimony trioxide and surface-active agent. All these are available indigenously.

It is suggested that the process should be taken up only by those firms which

manufacture allied products. No special plant and machinery are required. Only two vats are needed.

There is no minimum size for an economically viable unit. The bath is estimated to cost around Rs 24/litre.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

## CSIR SUPPORT TO RESEARCH

### New Schemes

#### Development of Hyper-abrupt p-n Junction Varactors

p-n Junction variable capacitance diodes (also known as varactors) have found widespread use in parametric amplification, voltage variable tuning, harmonic generation, detection and mixing. In many of these applications a hyperabrupt varactor is found superior to the varactors made using abrupt and linearly graded p-n junctions. This is because the former provides a higher voltage sensitivity of the capacitance and quite often a larger maximum to minimum capacitance ratio. Abrupt and linearly graded p-n junction varactors have already been developed by the Central Electronics Engineering Research Institute, Pilani. However, little effort has been made in the country to develop hyperabrupt varactors, and the country still depends on import.

In a new CSIR research scheme sanctioned to Dr M. S. Tyagi, Department of Electrical Engineering, Indian Institute of Technology, Kanpur, it is proposed to develop the theory and technology of hypersensitive varactors. The nature of the capacitance variation of a p-n junction varactor is characterized by its  $C-V$  index  $n$  defined as  $n = (\log C)/d(\log V)$ , where  $C$  represents the junction capacitance and  $V$ , the voltage. A hyperabrupt varactor has a value of  $n$  larger than

0.5. Precise control of  $n$  and its constancy over a wide range of voltage is desired in many applications of varactor diodes.

Specific studies to be undertaken in this project include the realization of a diffused impurity profile for silicon  $p^+-n$  varactors which would give a large value of  $n$  ( $n > 2$ ) over a wide range of voltage (4 to 12 V). For this optimized profile the quality factor  $Q$  and the cutoff frequency  $f_c$  of the diode are to be maximized. The development is expected to be brought to a stage where it can be directly handed over to a manufacturer. The devices will find use in radio broadcast transmitters as well as in various defence establishments.

#### Stress Corrosion Cracking of Prestressing Steel Wires

Use of prestressed concrete structures in civil engineering is increasing in India. Owing to the presence of both the stress and the corrosive environment, steel wires are susceptible to stress corrosion cracking and several cases of cracking and industrial failures involving these wires have occurred in Europe. However, much of the information is not published because of its confidential nature.

In a new CSIR research scheme granted jointly to Dr K.P. Singh (principal investigator) and Dr Raj Narayan (co-principal investigator), both of the Department of Metallurgical Engineer-

ing, Indian Institute of Technology, Kanpur, it is proposed to study the effect of microstructure and torsional stresses on electrochemical and stress corrosion behaviour of prestressing steel wires. The effect of surface coatings on the cracking behaviour will also be studied.

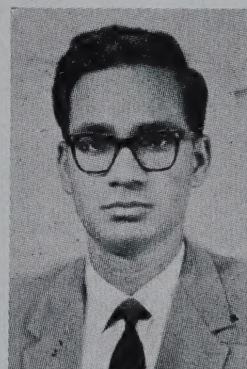
## PERSONNEL NEWS

### Appointments/Promotions

#### Shri S.K. Rao

Shri S.K. Rao, Scientist E, Regional Research Laboratory, Jorhat, has been appointed Scientist F at the Central Fuel Research Institute (CFRI), Dhanbad, with effect from 14 February 1977.

Shri Rao (born 1937) obtained B.E. in mechanical engineering from the Andhra University in 1959 and started his career as a junior engineer in the Public Works Department Workshops of Andhra Pradesh Government. Shri Rao was with the Heavy Engineering Corporation Ltd (HEC),



Ranchi, from 1962 to 1970 as an assistant engineer (designs). He was deputed to USSR in 1962 for training in steel plant equipment design and development. In HEC, he worked as a group leader for design, development and standardization concerning cranes and hoists; excavators and earth movers; continuous steel casting, rolling and merchant mills; cement mills; and blast furnaces, coke ovens and drilling rigs. He developed working projects on continuous steel casting dyes and equipment for mini-steel plants comprising electric arc furnaces and continuous steel casting machines.

Shri Rao joined the Regional Research Laboratory, Jorhat, as head of its General Engineering Division, in June 1970. Promoted as Scientist E in 1973, Shri Rao was entrusted with



the design and development of equipment and apparatus for projects of the laboratory. He worked on distillation plants for extraction of essential oils from forest resources. He also rendered technical advice on the fabrication of commercial scale distillation stills on turn-key basis. He did development work on multispeed hubs for bicycles and was associated with the projects on carbon black production and fluid bed combustion using Assam coals, cement manufacture in vertical shaft kiln, and polymer for iron ore beneficiation.

Shri Rao has to his credit 11 patents, five of which have already been sealed. He is member of the Institution of Engineers (India), Operations Research Society of India, and Assam Science Society and an associate member of the Institute of Standards Engineers. He has had management training in research and development at the Administrative Staff College of India, Hyderabad.

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The following personnel of the Central Electrochemical Research Institute, Karaikudi, have been promoted consequent on five-year assessment: Shri S. Thangavelu (as Scientist A; 3 July 1975); Dr P.N. Narayanan Namboodiri (as Scientist A; 19 Oct. 1975); Miss Alice Kurian (as Scientist A; 19 Oct. 1975); Shri S. Krishnamurthy (as Scientist A; 19 Oct. 1975); Shri B. Sathianandham (as Scientist A; 19 Jan. 1976); and Shri S. Ramamoorthy (as Scientist A; 28 February 1976).

### Symposium on Ion-Exchange at CSMCRI

A two-day symposium on Ion-Exchange will be held at the Central Salt & Marine Chemicals Research Institute, Bhavnagar, in February 1978. The following topics will be discussed :

(i) Synthetic and natural organic ion-exchangers : development, characterization and application.

- (ii) Synthetic and natural inorganic ion-exchangers : development, characterization and application.
- (iii) Ion-exchange technology in separation, purification and preparation of chemicals.
- (iv) Ion-exchange technology in desalination and purification of water.
- (v) Ion-exchange technique in atmospheric and hydrospheric pollution control, industrial effluent treatment, removal of poisonous elements, recovery of precious chemicals from industrial waste, etc.
- (vi) Ion-exchange membrane technology : preparation, characteriza-

tion and applications in electro-dialysis.

- (vii) Ion-exchange in analytical chemistry, e.g. pharmaceuticals and pathological applications ; ion selective electrodes, etc.
- (viii) Unconventional use of ion-exchange, e.g. materials as catalysts in gas storing, catalyst carrier, as molecular sieve, etc.

The date-line for sending full papers is 31 October 1977 and that for registration, 15 January 1978. Further details can be had from Dr D. R. Baxi or Dr G.T. Gadre, Secretary, Symposium on Ion-Exchange, Central Salt & Marine Chemicals Research Institute, Bhavnagar 364002.

## COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

### Advertisement No. 17/77

It is proposed to appoint a Study Director for Road User Cost Study in India—a cooperative research project taken up jointly by the World Bank and Government of India with the Central Road Research Institute as the principal implementing agency. The project has a duration of about 3 years, and the post is temporary and for the duration of the project.

**Qualifications & Experience :** Post-graduate (preferably Ph. D.) in traffic/transportation engineering or transportation economics with considerable experience in research, teaching and/or practice in related fields. A good part of the experience should be in active high-level research.

The qualifications and/or experience are relaxable in case of candidates found otherwise suitable.

**Job Requirements :** To provide high-level leadership in the planning and implementation of R & D programmes of this project with ability to organize and direct field studies and statistical analyses involving both engineering and economic variables. He shall be responsible for the working of this all-India project, involving considerable amount of field work and high-level management inputs and coordination with road and transport agencies. The project has international collaboration and the Study Director will be required to interact with foreign experts also.

**Salary & Conditions of Service :** The salary scale attached to the post is Rs 2000-125/2-2500 plus allowances, etc. Pay will be fixed according to merits.

The post is temporary as stated above. Other conditions of service will be supplied on request.

**Age Limit :** Below 50 years, relaxable in special cases.

Persons already working in government/semi-government/autonomous organizations should send their particulars through proper channel. The person selected may be required to serve anywhere in the country.

Those interested may obtain a standard proforma, for sending their *curriculum vitae*, from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. Completed *curriculum vitae* proforma must be received in this office by 15 September 1977.

Canvassing in any form and/or bringing in any influence will be treated as a disqualification for the post.